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T. Timm

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Oligochaeta of the Small Lakes of Southern Karelia

T. Timm

The material for the present article consisted of 2010 specimens of Oligochaeta from 98 samples of zoobenthos, collected during the period 1963-1965 by co-workers of the Karelian Division of the State Scientific Research Institute of Lake and River Fisheries (GOSNIORKh). The oligochaetes were made available to the author for processing by the late B.M. Aleksandrov. The lakes are situated in the southern part of the Karelian ASSR and make up the following five groups (fig. 1):

I. The Suoyarvi group
1. Suri-Kuokha-Yarvi
2. Pieni-Kuokha-Yarvi
3. Khirvas-Yarvi
4. Yuurikka-Yarvi
5. Purna-Yarvi
6. Munnon'-Yarvi
7. Khieti-Yarvi
8. Yuly-Yarvi
9. Keski-Yarvi
10. Vegarus'-Yarvi
11. Vuontelen-Yarvi

II. The Ladoga group
12. Syaks-Yarvi
13. Kot'-Yarvi
14. Varpa-Yarvi
15. Kima-Yarvi
16. Valkoma-Yarvi
17. Valkna-Yarvi
18. Sattisen'-Yarvi
19. Khippolan'-Yarvi
20. Vuortana-Yarvi
21. Uuksu-Yarvi
22. Sur-Korut'-Yarvi

III. The group of lakes of the Shui-Sunskii water divide
23. Kodisyarger
24. Myaranduksa
25. Syarg-Ozero
26. Uros
27. Rind-Ozero
28. Vokht-Ozero
29. Tilkus-Lampi
30. Peldo

IV. The Veshkelitsy group
31. Cheden'-Yarvi
32. Korzinskoe
33. Chason'-Yarvi
34. Lumbila-Yarvi
35. Sod'-Yarvi
36. Imat
37. Bol'shoe Korb'-Yarvi
38. Pekkoil'skoe I

V. The group of lakes of the Onega-Ladoga water divide
39. Vityari
40. Kodari
41. Virgari
42. Topornoe
43. Leib'-Yarvi
44. Nyalm-Ozero
45. Kainoz'-Yarvi
46. Tyurumyus'-Yarvi
47. Char-Ozero
48. Lizhmenskoe
49. Lamba No. 3 of the Kover-Lamba group
50. Akhpoi-Lamba
51. Sadi-Yarvi
52. Nikonovo
53. Kaskesnavolokskoe

The largest are Vegarus'-Yarvi (1266 ha) and Nyalm-Ozero (1006 ha). The areas of the remaining lakes do not exceed 700 ha, while that of the smallest (Akhpoi-Lamba) is only 3.4 ha. The maximum depth ranges from 1.3 m in Tilkus-Lampi to 23 m in Vityari and 42 m in Topornoe, with more than half of the lakes (33) having depths of up to 10 m. The water is very weakly mineralised, 0-25 mg/l of HCO'_3, rising to 40 mg/l in exceptional cases. The content of humic material is subject to wide variations. The permanganate oxidisability is 3.6-35.8 mg O_2/l. There is no distinct

boundary between the dystrophic and oligotrophic lakes (fig. 2). Only Lake Topornoe, which is deep, can be considered typically oligotrophic. The remaining shallow oligohumose lakes, often with water that has an acidic reaction, are placed within a subtype, sometimes called acidotrophic, and many of them have been eutrophised under the influence of neighbouring settlements or chemical treatment. There are no typical equilibrated eutrophic lakes here.

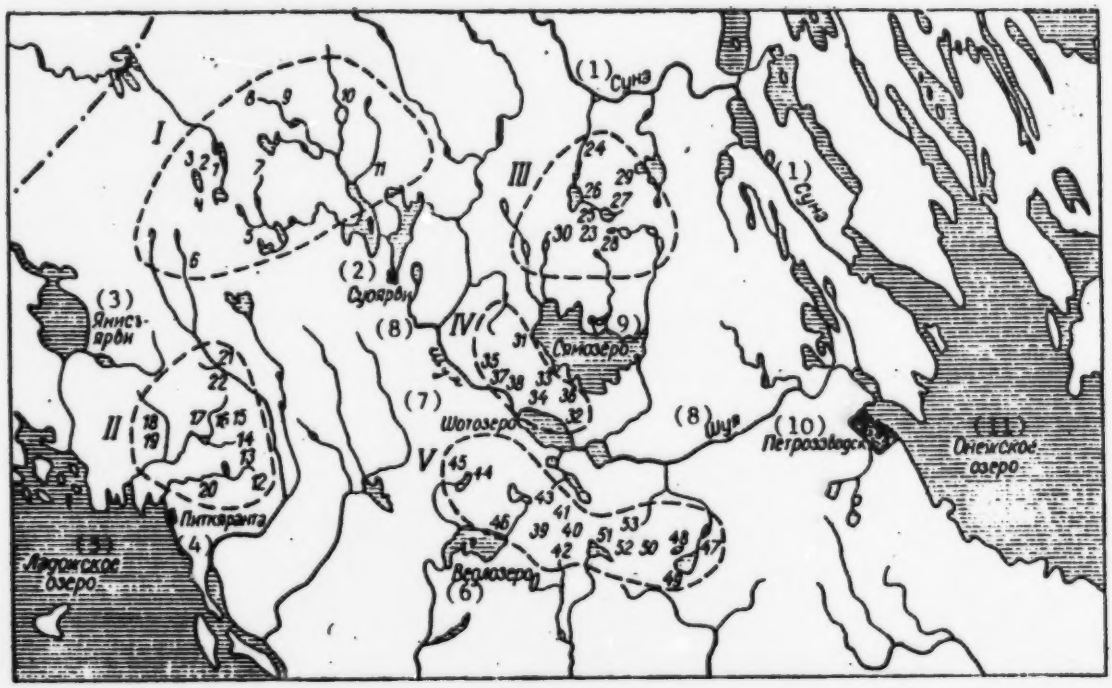

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Fig. 1. Geographic disposition of the lakes in Southern Karelia that were studied. The numerals on the map correspond to the serial numbers of the lakes as given in the text and in fig. 2.

Key:
(1) Suna
(2) Suo-Yarvi
(3) Yanis'-Yarvi
(4) Pitkyaranta
(5) Lake Ladoga
(6) Vedlo-Ozero
(7) Shot-Ozero
(8) Shuya
(9) Syam-Ozero
(10) Petrozavodsk
(11) Lake Onega

The following 23 species and forms from four families (Naididae, Tubificidae, Enchytraeidae, Lumbriculidae) were discovered in the material:

1. Stylaria lacustris (L., 1767), 11 specimens in 8 samples from 7 lakes (3, 24, 26, 40, 44, 46, 53). At depths of 0-5.9 m, more often in the littoral. From June to September. In the sexually mature state, singly in June and August.

2. Arcteonais lomondi (Martin, 1907). Seventeen sexually immature specimens in 3 samples from 3 lakes (26, 36, 44), at depths of 1-4.1 m.

3. Ripistes parasita (Schmidt, 1847). A single sexually immature specimen was found at a depth of 1.5 m (46).

4. Slavina appendiculata (d'Udekem, 1855). Sixteen sexually immature specimens in 2 samples (23, 25) from mud at depths of 1.7-2.1 m.

5. Nais sp. One undetermined specimen closer to the rear end (23).

6. Uncinais uncinata (Oersted, 1842). Twenty-one specimens in 8 samples from 6 lakes (8, 24, 26, 27, 30, 42), from mud and sand at depths of 0-4.1 m. From June through August. Sexually mature specimens in July and (100%) August.

7. Chaetogaster diaphanus (Gruithuisin, 1828). One sexually immature specimen in July (26).

8. Aulodrilus limnobius (Bretscher, 1899). Four specimens, including one that was sexually mature, in 3 samples (25, 28, 30). In July and August, at depths of 1.3-2.5 m.

9. A. pluriseta (Piguet, 1906). A total of 1020 specimens in 13 samples from 9 lakes (23, 24, 36-38, 40, 43, 44, 47). In mud at depths of 1.0-6.2 m. From June through October. Sexually mature, once in August.

10. A. pigueti (Kowalewski, 1914). One sexually immature specimen from mud at a depth of 2.1 m (25). The dorsal and fan-shaped setae begin at the 7th segment and have two well defined teeth, connected by a membrane (fig. 3, 1-4). The body length is only 4 mm; there are 30 segments. This is undoubtedly the young worm captured on July 13, 1964.

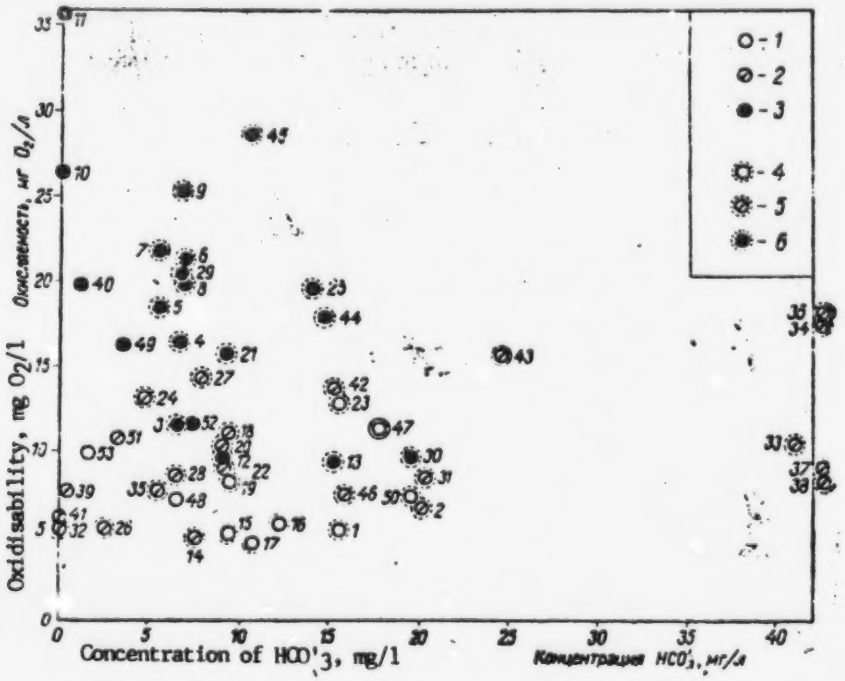

Fig. 2. Some hydrochemical indices of the water in the lakes that were studied. Colour of the water: 1 - green and blue tones; 2 - yellow tones; 3 - brownish and brown tones. Active reaction of the water (pH): 4 - below 6.0; 5 - from 6.0 to 8.0; 6 - above 8.0. There are no data on the HCO'_3 content in the water of lakes 34 and 36-38.

11. Limnodrilus udekemianus Claparède, 1862. Three specimens in 2 samples (29, 50). Depth up to 1 m. August; sexually immature.

12. L. hoffmeisteri Claparède, 1862. Sixty-four specimens in 10 samples from 8 lakes (14, 20, 27, 40, 43, 44, 46, 47). At depths of 0-5.1m, from June through September, with clitella beginning in July. Predominates in Char-Ozero.

13. Potamothrix hammoniensis (Michaelson, 1901). Ten specimens in 4 samples from 3 lakes (28, 44, 45). At depths of 1.5-2.5 m in the mud of the open parts of large but shallow lakes. Predominates in Kainoz'-Yarvi. 34

14. P. bedoti (Piguet, 1913). Thirteen specimens in 2 samples (23, 38). In the mud of eutrophised lakes at depths of 2.6-2.9 m. In June and October. In sexually mature specimens (June), spermathecae and spermathecal setae (fig. 3, 19) at the 8th segment only.

15. Tubifex tubifex (Müller, 1773). A total of 530 specimens in 27 samples from 19 lakes (5, 10, 23, 25, 28, 31, 33-37, 39, 41-44, 49-51). In various earth materials, at depths of 0-29 m. Relative frequency of occurrence increases with depth. Young and girdled worms occur from June to October.

16. T. ignotus (Stolc, 1886). Eight specimens in 3 samples from 3 lakes (24, 41, 45), near the water's edge and at depths of 7-8 m.

17. Umbadrilus saamicus Timm, 1978. A single fragment was fished from Lake Kodisyager (23) on June 23, 1964, from dark brownish mud at a depth of 2.9 m. The species was described fairly recently by the author on the basis of a specimen from the Murmansk Oblast' (Timm and Popchenko, 1978) and was subsequently also discovered in Lake Võrtsjärv in the Estonian SSR. Cephalic end, consisting of 18 segments, has a length of 3mm and a diameter at the clitellum of 0.36 mm. In the ventral fascicles there

are 1-5 setae 39-54 microns in length; the dorsal fascicles consist of 1-4 fan-shaped setae 36-61 microns long, and of 2-6 (post-clitellar 1-2) capillary setae measuring 130-333 microns (fig. 3, 6-10). No ventral setae at the 8th and 9th segments. Clitellum on half of the 8th and 9th segments (fig. 4, 2). Thickness of epithelium on ventral side of clitellum 25 microns, externally to clitellum - 6-10; thickness of annular musculature 1 micron, of longitudinal - 3-8 microns. Testes at the 8th, ovaries at the 9th segment; sperm sacs and ovisacs undeveloped. Spermatic infundibula at dissepiment of 8th/9th. Vas deferentia longer than atria, sinuous, stout (20 microns); lumen 7 microns in diameter, with cilia. Atria short, tubular. The large prostate gland discharges into the proximal part of the atrium. Penises in small penile bursae. Penile tubules in the shape of a truncated cone of up to 30 microns long and up to 30 microns wide; at the narrow end - 20 microns. Male genital openings on ventral side of 9th segment. The large round ampullae of the spermatheca contain bundles of sperm cells, not collected into spermatozeugmae; thick-walled ducts open ventrally at the 8th segment (fig. 4, 1). In the external features, and especially the unusual positioning of the genital system at the 8th and 9th segments, this species resembles the Potamothrix bedoti found in the same sample. However, in the structure of the genitals the two species are radically different.

18. Spirosperma ferox (Eisen, 1879). Total of 112 specimens in 42 samples from 29 lakes (2-4, 6-9, 12-20, 22-24, 27, 28, 40, 42-46, 48, 52). The most dispersed species. Discovered at depths of 0-19.5 m. From June to September; found with clitellum in June and July.

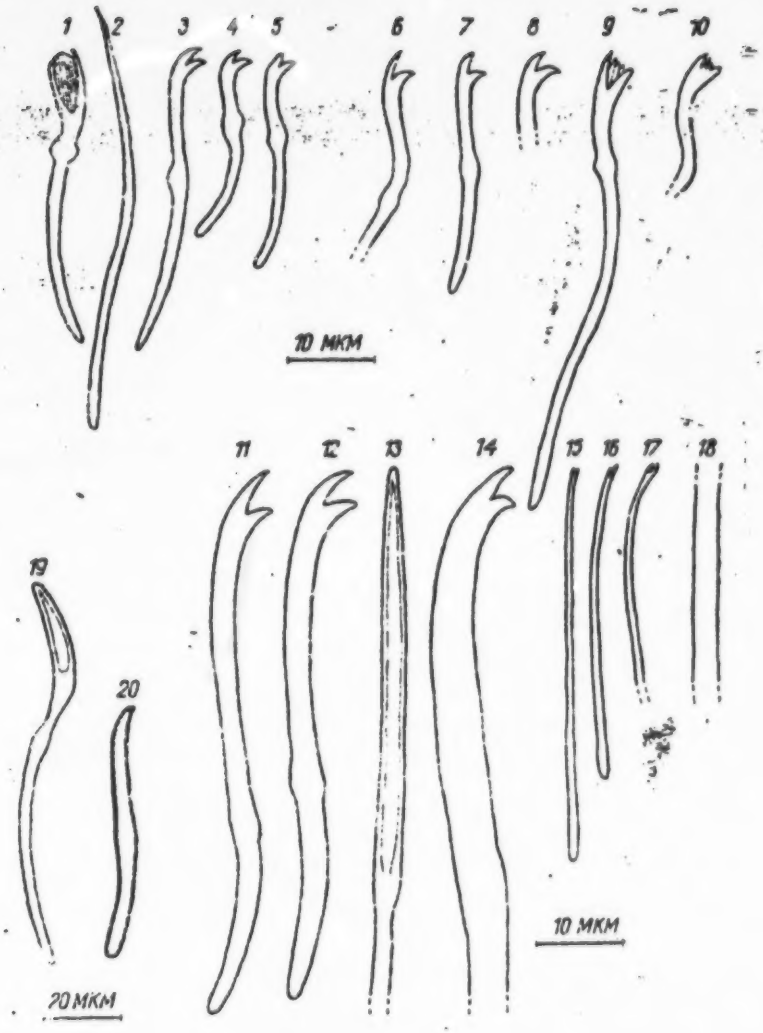

Fig. 3. Setae. Aulodrilus pigueti: 1 and 2 - dorsal of 9th segment; 3 - ventral of 3rd s., 4 - ventral of 8th s., 5 - ventral of 18th s. Umbadrilus saamicus: 6 - ventral of 4th s., 7 - ventral of 6th s., 8 - ventral of 15th s., 9 - dorsal of 5th s., 10 - dorsal of 15th s. Alexandrovia onegensis: 11 - ventral of 3rd s., 12 - ventral of 8th s., 13 - ventral (spermathecal) of 10th s., 14 - ventral of posterior part of body, 15-17 - dorsal acicular, 18 - part of a capillary seta. Potamothrix bedoti: 19 - ventral (spermathecal) of 8th s. Cognettia glandulosa: 20 - seta.

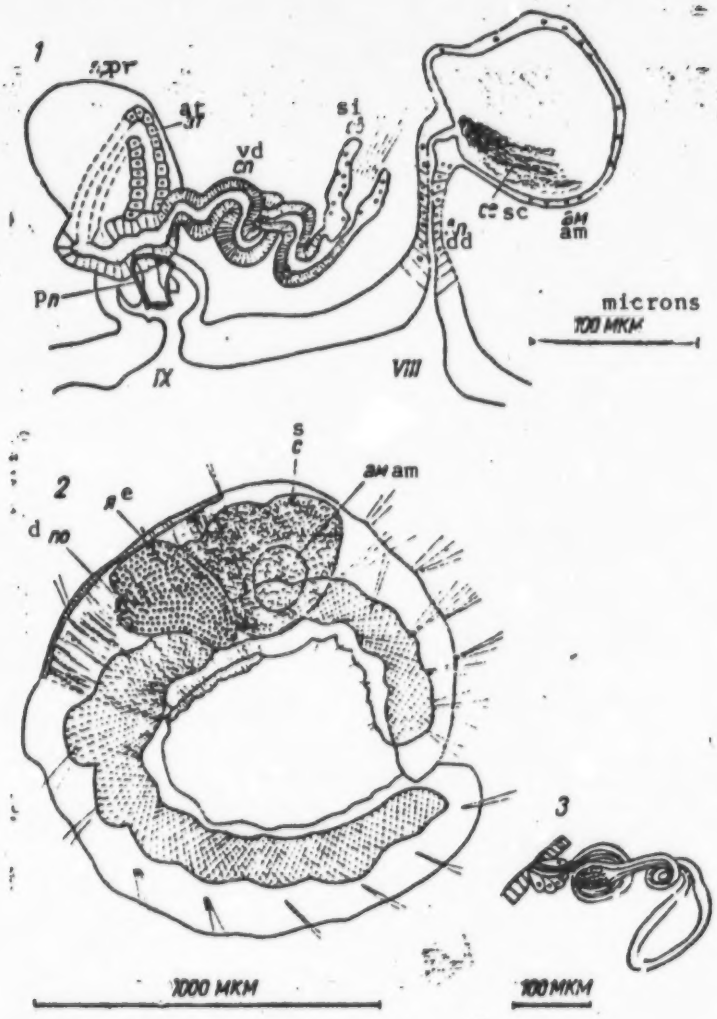

Fig. 4. Umbradilus saamicus: 1 – reconstruction of elements of the genital system at the 8th and 9th segments from sagittal sections, 2 – overall view. am – ampulla of spermotheca, at – atrium, dd – discharge duct of spermatheca, p – penis with penile tubule, cl – clitellum, pr – prostate, s – mass of sperm cells in body cavity, sc – sperm cells in spermotheca, si – spermatic infundibulum, vd – vas deferens, e – egg. Cognettia glandulosa: 3 – reconstruction of spermatheca from transverse sections.

19. Alexandrovia onegensis Hrabe, 1962. Thirteen specimens in 3 samples, collected on August 31, 1963 in Lake Topornoe (42) from mud at depths of 11.5-29 m. It was here but at a depth of only 4 m that the Spirosperma ferox which resembles it was discovered. Five of the 13 specimens had clitella; some also had spermatozeugmas. The A. onegensis from Lake Topornoe is differentiated from the original description of the species from Lake Onega (Hrabe, 1962) by the smaller dimensions (length 7-11 mm instead of 10-20), the larger number of segments (48-54 instead of 35), the thicker wall of the body (epithelium with layer of secretion about 35 microns instead of 9-32), the longer clitellum (at the 10th-12th segments instead of the 10th-11th) and the bidentate nature of the dorsal acicular setae (fig. 3, 11-18). The latter characteristic was also discovered subsequently in the specimens from Lake Onega (Popchenko, 1972). 37

20. Cognettia glandulosa (Michaelson, 1888). Nine specimens in a sample from the littoral of Lake Khieti-Yarvi (7), August 2, 1965. One of them had a clitellum and a further three had a developed genital system. Male genital openings instead of the ventral fascicles of the 8th segment. Spermathecae at the 5th segment are typical of the species (fig. 3, 20; 4, 3).

21. Enchytraeidae gen. gen. sp. sp. Forty-eight specimens of sexually immature Enchytraeidae were discovered in 7 samples from 6 lakes 2, 3, 8, 21, 28, 30) at depths of 0-4 m. They belong to various species and perhaps, in part, to the preceding species.

22. Lumbriculus variegatus (Müller, 1773). Sixty-one specimens in 21 samples from 15 lakes (1, 4, 7, 13, 15, 24, 26-28, 32, 35, 39, 40, 44,

53). In various earth materials at depths of 0-6.4 m. From June through October. In Vokht-Ozero (28) on July 30, 1964, together with sexually immature worms, two sexually mature individuals were caught. In them, the clitellum was situated between the 6th and 17th segments or between the 8th and ½ of the 18th. Male genital openings as follows: in one worm, at the 9th segment (on one side only), in the second - on one side at the 8th and on the other side at the 9th segment. In the thin sections of the first specimen, paired testes but only one atrium were detected at the 9th segment, ovaries at the 10th, paired spermathecae at the 11th and 12th and unpaired spermathecae (on different sides) at the 13th and 14th segments.

23. Stylodrilus heringianus Claparède, 1862. Thirty-seven individuals in 12 samples from 9 lakes (3, 7, 24, 26, 39, 40, 42, 46, 51). In various earth materials at depths of 0-18.5 m. Occurs from June to September, individuals with a clitellum - from June to August.

In view of the relative paucity of the samples (on the average, about two per lake), we have an incomplete knowledge of the fauna of certain of the lakes. The list of 23 species is also meagre when compared with the 106 species which have been reported from Karelia according to published data (Popchenko, 1972). The Naididae are poorly represented (a small number of samples are from the weeds!), besides which some widely disseminated forms from other families are absent. This is on account of the peculiarities of the small lakes of Karelia overall (the relatively high humification at low levels of mineralisation and small depths). The most frequently occurring species were Spirotherma ferox (in 29 lakes), Tubifex tubifex (19) and Lumbriculus variegatus (15). Deserving of mention

is the presence of the rare species Potamothrix bedoti, Alexandrovia onegensis, Aulodrilus pigueti and Umbadrilus saamicus.

The majority of the species avoid polyhumic lakes. It would appear that Lumbriculus variegatus, Stylodrilus heringianus, Tubifex ignotus (which on one occasion was even found in the polyhumic Vuontelen-Yarvi) and Cognettia glandulosa prefer lakes with a low mineralisation and acidic water, while, conversely, the species Aulodrilus and Potamothrix bedoti prefer shallow, eutrophised lakes containing alkaline or neutral water. There is no doubt that the profundal species Alexandrovia onegensis is also stenotopic. Tubifex tubifex can be considered ubiquitous.

The majority of the species are found in the littoral or sublittoral, usually at depths of 5-6 m. The profundal region is populated (with the exception of Lake Topornoe) by a small number of species which also inhabit the shallows: Spirosperma ferox, Tubifex tubifex, and less frequently, Stylodrilus heringianus.

The small lakes that were studied are sharply differentiated from the large, ultraoligotrophic lakes (Ladoga, Onega et al.) by the absence of specific profundal forms. An exception is the deepest of them, Lake Topornoe with Alexandrovia onegensis in the profundal.

They are also differentiated from the eutrophic lakes of the zone of mixed forests, where Potamothrix hammoniensis is the predominant oligochaete species in the profundal. The latter phenomenon is rarely seen in Karelia and at that, only in extremely shallow lakes (Kainoz'-Yarvi). It is difficult to say whether the explanation for this is to be found in differences in the hydrochemical condition or in climatic and other factors.

The boundary between the regions comprising the Spirosperma- and Potamothrix-lakes (on the basis of the dominant oligochaete species in the profundal) passes through the Karelian Isthmus.

Of the isolated groups of lakes, the Suoyarvi and the Ladoga groups in the western part of the republic, despite the differing degree of humification (more polyhumic in the former, more oligohumic in the latter) have a common feature: the extreme scantiness of the species. In 22 lakes, together with what were taken, nine Oligochaete species were found and in many of the lakes, there was only one Spirosperma ferox. Presumably, these less eutrophised lakes represent the oldest type of oligochaete fauna of the small lakes of Southern Karelia. In 15 lakes of the Onega-Ladoga water divide, 16 species have already been discovered: together with S. ferox, Tubifex tubifex and Limnodrilus hoffmeisteri (which is dominant in Char-Ozero) occur frequently, with Potamothrix hammoniensis, Aulodrilus pluriseta and the Naididae being rarer. The lakes of the Shui-Sunskii water divide (shallow and evidently more eutrophised) are characterised by a comparative abundance of oligochaete forms (21 species from 8 lakes), among which there are no especially predominant species. In the lakes of the Veshkelitsy Group (small and less eutrophised), some rapidly proliferating species are flourishing (Aulodrilus pluriseta and Tubifex tubifex): only five oligochaete species have been obtained from 8 lakes.

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OLIGOCHAETES OF SMALL LAKES OF SOUTH KARELIA

T. TIMM

Summary

23 species and forms of oligochaetes were found in 98 samples obtained from 53 small lakes (3.4—1266 ha) of 5 various localities in the southern part of the Karelian ASSR. *Spirosperma ferox, Tubifex tubifex* and *Lumbriculus variegatus* were the most frequent species. The rare species included *Potamothrix bedoti* (in two shallow, eutrophized lakes), *Alexandrovia onegensis* (in the profundal of Lake Topornoye with a maximal depth of 42 m), *Aulodrilus pigueti* and *Umbadrilus saamicus*. In most eutrophized lakes of the Veshkelitskaya group a mass development of *Aulodrilus pluriseta* and *Tubifex tubifex* was observed. The author presents data on the environment and morphology of some species. With respect to the dominant species, the small Karelian lakes differ distinctly from those situated south of the Karelian Isthmus.